

IN THE CLAIMS

Claims 1-12 (Cancelled)

13. (Previously Presented) A thin film magnetic memory device, comprising:
a memory array having a plurality of magnetic memory cells arranged in every other memory cell row and every other memory cell column such that each memory cell of said plurality of memory cells is separated from another by an adjoining memory cell location in a row direction and an adjoining memory cell location in a column direction, each of said plurality of magnetic memory cells including
a magnetic storage portion having a resistance value that varies according to a level of storage data to be written when a data write magnetic field applied by first and second data write currents is larger than a predetermined magnetic field, and
a memory cell selection gate for passing a data read current therethrough into said magnetic storage portion in a data read operation;
a plurality of write word lines provided corresponding to the respective rows of the magnetic memory cells, and selectively activated according to a row selection result in a data write operation so as to cause said first data write current to flow therethrough;
a plurality of read word lines provided corresponding to the respective rows, for actuating the corresponding memory cell selection gate according to a row selection result in said data read operation;
a plurality of write data lines provided corresponding to the respective columns of the magnetic memory cells, for causing said second data write current to flow therethrough in said data write operation; and
a plurality of read data lines provided corresponding to the respective columns, for causing said data read current to flow therethrough in said data read operation, wherein
adjacent magnetic memory cells share a corresponding one of at least one of said plurality of write word lines, said plurality of read word lines, said plurality of read data lines and said plurality of write data lines.

14. (Previously Presented) A thin film magnetic memory device, comprising:

- a memory array having a plurality of magnetic memory cells arranged in rows and columns, each of said plurality of magnetic memory cells including
 - a magnetic storage portion having a resistance value that varies according to a level of storage data to be written when a data write magnetic field applied by first and second data write currents is larger than a predetermined magnetic field, and
 - a memory cell selection gate for passing a data read current therethrough into said magnetic storage portion in a data read operation;
- a plurality of write word lines provided corresponding to the respective rows of the magnetic memory cells, and selectively activated according to a row selection result in a data write operation so as to cause said first data write current to flow therethrough;
- a plurality of read word lines provided corresponding to the respective rows, for actuating the corresponding memory cell selection gate according to a row selection result in said data read operation;
- a plurality of write data lines provided corresponding to the respective columns of the magnetic memory cells, for causing said second data write current to flow therethrough in said data write operation; and
- a plurality of read data lines provided corresponding to the respective columns, for causing said data read current to flow therethrough in said data read operation, wherein
 - adjacent magnetic memory cells share a corresponding one of at least one of said plurality of write word lines, said plurality of read word lines, said plurality of read data lines and said plurality of write data lines,
 - wherein
 - said adjacent magnetic memory cells share one of the corresponding write word line and the corresponding write data line, which is located farther from the respective magnetic storage portions, and
 - said one of the write word line and the write data line has a larger cross-sectional area than that of the other of the write word line and the write data line.

15. (Previously Presented) A thin film magnetic memory device, comprising:
a memory array having a plurality of magnetic memory cells arranged in rows and columns, each of said plurality of magnetic memory cells including
a magnetic storage portion having a resistance value that varies according to a level of storage data to be written when a data write magnetic field applied by first and second data write currents is larger than a predetermined magnetic field, and
a memory cell selection gate for passing a data read current therethrough into said magnetic storage portion in a data read operation;
a plurality of write word lines provided corresponding to the respective rows of the magnetic memory cells, and selectively activated according to a row selection result in a data write operation so as to cause said first data write current to flow therethrough;
a plurality of read word lines provided corresponding to the respective rows, for actuating the corresponding memory cell selection gate according to a row selection result in said data read operation;
a plurality of write data lines provided corresponding to the respective columns of the magnetic memory cells, for causing said second data write current to flow therethrough in said data write operation; and
a plurality of read data lines provided corresponding to the respective columns, for causing said data read current to flow therethrough in said data read operation, wherein adjacent magnetic memory cells share a corresponding one of at least one of said plurality of write word lines, said plurality of read word lines, said plurality of read data lines and said plurality of write data lines,
wherein one of each write word line and each write data line, which is located farther from the corresponding magnetic storage portions, is formed from a material having higher electromigration resistance than that of the other of each write word line and each write data line.

16. (Previously Presented) A thin film magnetic memory device, comprising:
a memory array having a plurality of magnetic memory cells arranged in rows and columns, each of said plurality of magnetic memory cells including

a magnetic storage portion having a resistance value that varies according to a level of storage data to be written when a data write magnetic field applied by first and second data write currents is larger than a predetermined magnetic field, and

a memory cell selection gate for passing a data read current therethrough into said magnetic storage portion in a data read operation;

a plurality of write word lines provided corresponding to the respective rows of the magnetic memory cells, and selectively activated according to a row selection result in a data write operation so as to cause said first data write current to flow therethrough;

a plurality of read word lines provided corresponding to the respective rows, for actuating the corresponding memory cell selection gate according to a row selection result in said data read operation;

a plurality of write data lines provided corresponding to the respective columns of the magnetic memory cells, for causing said second data write current to flow therethrough in said data write operation; and

a plurality of read data lines provided corresponding to the respective columns, for causing said data read current to flow therethrough in said data read operation, wherein adjacent magnetic memory cells share a corresponding one of at least one of said plurality of write word lines, said plurality of read word lines, said plurality of read data lines and said plurality of write data lines,

wherein

adjacent magnetic memory cells in the column direction share a corresponding one of said plurality of write word lines,

every two of said plurality of read data lines form a read data line pair in said data read operation,

the magnetic memory cells selected by a same read word line are respectively connected to one of the two read data lines of each of said read data line pairs, and

said data read current is supplied to each of the two read data lines of the read data line pair corresponding to a column selection result.

17. (Previously Presented) A thin film magnetic memory device, comprising:

- a memory array having a plurality of magnetic memory cells arranged in rows and columns, each of said plurality of magnetic memory cells including
 - a magnetic storage portion having a resistance value that varies according to a level of storage data to be written when a data write magnetic field applied by first and second data write currents is larger than a predetermined magnetic field, and
 - a memory cell selection gate for passing a data read current therethrough into said magnetic storage portion in a data read operation;
- a plurality of write word lines provided corresponding to the respective rows of the magnetic memory cells, and selectively activated according to a row selection result in a data write operation so as to cause said first data write current to flow therethrough;
- a plurality of read word lines provided corresponding to the respective rows, for actuating the corresponding memory cell selection gate according to a row selection result in said data read operation;
- a plurality of write data lines provided corresponding to the respective columns of the magnetic memory cells, for causing said second data write current to flow therethrough in said data write operation; and
- a plurality of read data lines provided corresponding to the respective columns, for causing said data read current to flow therethrough in said data read operation, wherein adjacent magnetic memory cells share a corresponding one of at least one of said plurality of write word lines, said plurality of read word lines, said plurality of read data lines and said plurality of write data lines,
 - wherein
 - adjacent magnetic memory cells in the column direction share a corresponding one of said plurality of read word lines,
 - every two of said plurality of write data lines form a write data line pair in said data write operation,
 - the magnetic memory cells selected by a same write word line are respectively connected to one of the two write data lines of each of said write data line pairs, and
 - said second data write current is supplied to each of the two write data lines of the write data line pair corresponding to a column selection result as currents of opposite directions.

18. (Original) The thin film magnetic memory device according to claim 17, further comprising:

a switching circuit for electrically coupling the two write data lines of said write data line pair to each other in said data write operation, and

a data write circuit for supplying first and second voltages respectively to the two write data lines of said write data line pair corresponding to the column selection result in said data write operation.

19. (Previously Presented) The thin film magnetic memory device according to claim 13, wherein said adjacent magnetic memory cells correspond to nearest adjacent memory cells.

20. (New) A thin film magnetic memory device, comprising:

a memory array having a plurality of magnetic memory cells arranged in every other memory cell row and every other memory cell column such that each memory cell of said plurality of memory cells is separated from another by an adjoining memory cell location in a row direction and an adjoining memory cell location in a column direction, each of said plurality of magnetic memory cells including

a magnetic storage portion having a resistance value that varies according to a level of storage data to be written when a data write magnetic field applied by first and second data write currents is larger than a predetermined magnetic field;

a plurality of write word lines provided corresponding to the respective rows of the magnetic memory cells, and selectively activated according to a row selection result in a data write operation so as to cause said first data write current to flow therethrough;

a plurality of read word lines provided corresponding to the respective rows, and selectively activated according to a row selection result in a data read operation so as to cause a data read current to flow through the magnetic storage portion in a selected memory cell of said plurality of magnetic memory cells;

a plurality of write data lines provided corresponding to the respective columns of the magnetic memory cells, for causing said second data write current to flow therethrough in said data write operation; and

a plurality of read data lines provided corresponding to the respective columns, for causing said data read current to flow therethrough in said data read operation, wherein

adjacent magnetic memory cells share a corresponding one of at least one of said plurality of write word lines, said plurality of read word lines, said plurality of read data lines and said plurality of write data lines.

21. (New) A thin film magnetic memory device, comprising:

a memory array having a plurality of magnetic memory cells arranged in rows and columns, each of said plurality of magnetic memory cells including

a magnetic storage portion having a resistance value that varies according to a level of storage data to be written when a data write magnetic field applied by first and second data write currents is larger than a predetermined magnetic field;

a plurality of write word lines provided corresponding to the respective rows of the magnetic memory cells, and selectively activated according to a row selection result in a data write operation so as to cause said first data write current to flow therethrough;

a plurality of read word lines provided corresponding to the respective rows, and selectively activated according to a row selection result in a data read operation so as to cause a data read current to flow through the magnetic storage portion in a selected memory cell of said plurality of magnetic memory cells;

a plurality of write data lines provided corresponding to the respective columns of the magnetic memory cells, for causing said second data write current to flow therethrough in said data write operation; and

a plurality of read data lines provided corresponding to the respective columns, for causing said data read current to flow therethrough in said data read operation, wherein

adjacent magnetic memory cells share a corresponding one of at least one of said plurality of write word lines, said plurality of read word lines, said plurality of read data lines and said plurality of write data lines,

wherein

said adjacent magnetic memory cells share one of the corresponding write word line and the corresponding write data line, which is located farther from the respective magnetic storage portions, and

said one of the write word line and the write data line has a larger cross-sectional area than that of the other of the write word line and the write data line.

22. (New) A thin film magnetic memory device, comprising:

a memory array having a plurality of magnetic memory cells arranged in rows and columns, each of said plurality of magnetic memory cells including

a magnetic storage portion having a resistance value that varies according to a level of storage data to be written when a data write magnetic field applied by first and second data write currents is larger than a predetermined magnetic field;

a plurality of write word lines provided corresponding to the respective rows of the magnetic memory cells, and selectively activated according to a row selection result in a data write operation so as to cause said first data write current to flow therethrough;

a plurality of read word lines provided corresponding to the respective rows, and selectively activated according to a row selection result in a data read operation so as to cause a data read current to flow through the magnetic storage portion in a selected memory cell of said plurality of magnetic memory cells;

a plurality of write data lines provided corresponding to the respective columns of the magnetic memory cells, for causing said second data write current to flow therethrough in said data write operation; and

a plurality of read data lines provided corresponding to the respective columns, for causing said data read current to flow therethrough in said data read operation, wherein

adjacent magnetic memory cells share a corresponding one of at least one of said plurality of write word lines, said plurality of read word lines, said plurality of read data lines and said plurality of write data lines,

wherein one of each write word line and each write data line, which is located farther from the corresponding magnetic storage portions, is formed from a material having higher electromigration resistance than that of the other of each write word line and each write data line.

23. (New) A thin film magnetic memory device, comprising:

a memory array having a plurality of magnetic memory cells arranged in rows and columns, each of said plurality of magnetic memory cells including

a magnetic storage portion having a resistance value that varies according to a level of storage data to be written when a data write magnetic field applied by first and second data write currents is larger than a predetermined magnetic field;

a plurality of write word lines provided corresponding to the respective rows of the magnetic memory cells, and selectively activated according to a row selection result in a data write operation so as to cause said first data write current to flow therethrough;

a plurality of read word lines provided corresponding to the respective rows, and selectively activated according to a row selection result in a data read operation so as to cause a data read current to flow through the magnetic storage portion in a selected memory cell of said plurality of magnetic memory cells;

a plurality of write data lines provided corresponding to the respective columns of the magnetic memory cells, for causing said second data write current to flow therethrough in said data write operation; and

a plurality of read data lines provided corresponding to the respective columns, for causing said data read current to flow therethrough in said data read operation, wherein

adjacent magnetic memory cells share a corresponding one of at least one of said plurality of write word lines, said plurality of read word lines, said plurality of read data lines and said plurality of write data lines,

wherein

adjacent magnetic memory cells in the column direction share a corresponding one of said plurality of write word lines,

every two of said plurality of read data lines form a read data line pair in said data read operation,

the magnetic memory cells selected by a same read word line are respectively connected to one of the two read data lines of each of said read data line pairs, and

said data read current is supplied to each of the two read data lines of the read data line pair corresponding to a column selection result.

24. (New) A thin film magnetic memory device, comprising:

a memory array having a plurality of magnetic memory cells arranged in rows and columns, each of said plurality of magnetic memory cells including

a magnetic storage portion having a resistance value that varies according to a level of storage data to be written when a data write magnetic field applied by first and second data write currents is larger than a predetermined magnetic field;

a plurality of write word lines provided corresponding to the respective rows of the magnetic memory cells, and selectively activated according to a row selection result in a data write operation so as to cause said first data write current to flow therethrough;

a plurality of read word lines provided corresponding to the respective rows, and selectively activated according to a row selection result in a data read operation so as to cause a data read current to flow through the magnetic storage portion in a selected memory cell of said plurality of magnetic memory cells;

a plurality of write data lines provided corresponding to the respective columns of the magnetic memory cells, for causing said second data write current to flow therethrough in said data write operation; and

a plurality of read data lines provided corresponding to the respective columns, for causing said data read current to flow therethrough in said data read operation, wherein

adjacent magnetic memory cells share a corresponding one of at least one of said plurality of write word lines, said plurality of read word lines, said plurality of read data lines and said plurality of write data lines,

wherein

adjacent magnetic memory cells in the column direction share a corresponding one of said plurality of read word lines,

every two of said plurality of write data lines form a write data line pair in said data write operation,

the magnetic memory cells selected by a same write word line are respectively connected to one of the two write data lines of each of said write data line pairs, and

said second data write current is supplied to each of the two write data lines of the write data line pair corresponding to a column selection result as currents of opposite directions.